Case-study Comparison of Two Indices for Ranking Ecosystem Restoration Projects Based on National Benefit

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History

- Government Performance and Results Act
  - Activities ranked to indicate value to the Nation
  - Separate ranking of feasibility study & construction
- Restoration benefits are not to be monetized
- Resource Significance Index (RSI)
  - First application in the 2006 budget
  - Some modification since
- Biodiversity Security Index (BSI)
  - Development since 2007 & continues
  - Case study of feasibility study ranking in 2010

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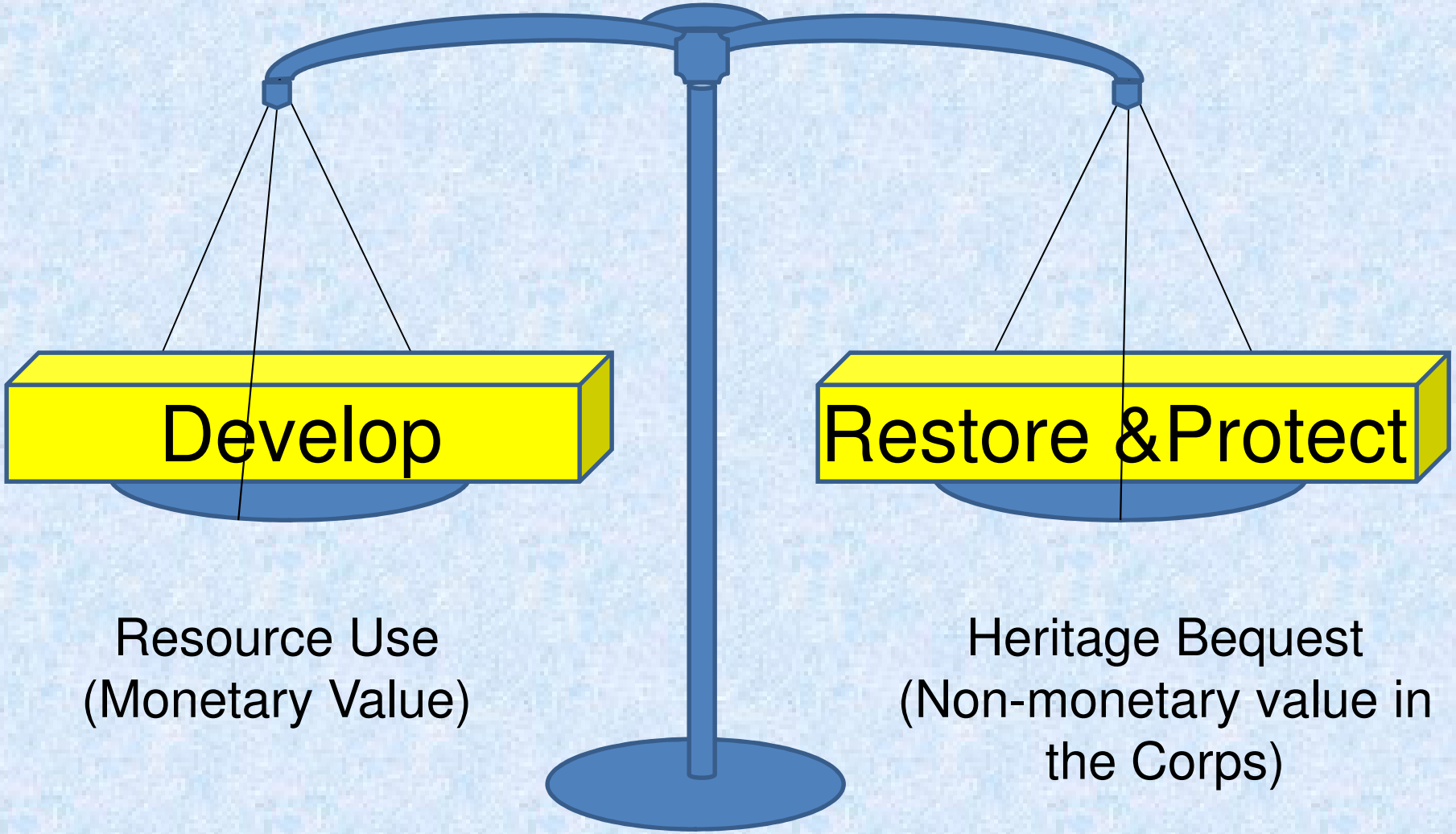
Metric Comparison Objectives

- Conceptual comparison
  - National interest
  - Standard of value
- Case study comparison
  - Performance differences in ranking

National Interest:

- In sum: protecting & improving public welfare
- Corps authority is to restore and protect aquatic environmental ~~quality~~ in the public interest
- NEPA policy & goals indicate public interest in:
  - Human welfare maintenance and improvement
  - Encouraging beneficial use of the environment
  - Preserving national heritage from destructive use

Balancing National Interests



Resource Use
(Monetary Value)

Heritage Bequest
(Non-monetary value in the Corps)

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Standard of Value: PGN Insights:

- Resource significance and scarcity are important
- Restoration should improve long-term survival of self regulating ecosystems (i.e., self sustaining)
- Success is indicated by project area ability to sustain:
  - A large variety of native plants and animals
  - More of the biologically desirable species
  - Ecosystem support for the desired outputs
- Measurement is based on changes in ecological quality as a function of habitat improvement

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Standard of Value Concept:

Standard of value is a basis for comparison—

fair market value (willingness to pay) Use value $

viable species (attribute scarcity) Heritage Value

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BSI for Feasibility Study Ranking:

BSI = $$\sum_{S=1\ldots n} ((wD)(wG))_s$$

s = indicator species

wG = policy weighted indicator of species security level

wD = policy weighted indicator of species distinctiveness

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Security Status (G):

Security Status *	# Populations	Weight
GX Presumed Globally Extinct	0	0
GH Possibly Extinct	0?	0
G1 Greatly Imperiled	1 < 6	64
G2 Imperiled	6<24	16
G3 Vulnerable	24<96	4
G4 Generally Secure from Extinction	96<384	1
G5 Secure (self-sustaining in wild)	>384	0

* From NatureServe Explorer Database

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Table 1. BSI calculation an estuarine wetland near the mouth of the Napa River, California.

Scientific name	Common name	Status	Mult	Fam #	Mult	Total
Reithrodontomys raviventris	Harvest mouse	G1-2	64	76	0.0132	0.8448
Acipenser medirostris	Green sturgeon	G3	4	8	0.1250	0.5000
Eucyclogobius newberryi	Tidewater goby	G3	4	24	0.0417	0.1668
Hypomesus transpacificus	Delta smelt	G1	64	7	0.1429	9.1456
Polygonum marinense	Marin knotweed	G1	64	375	0.0027	0.2728
Rhynchospora californica	California beakrush	G1	64	830	0.0012	0.0768
Suaeda californica	California sea-blite	G1	64	148	0.0068	0.4352
Symphyotrichum lentum	Suisun marsh aster	G2	16	2298	0.0004	0.0064
Total						11.448

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Biodiversity Security Index (BSI):

- National interest: restoring national ecological heritage
  - Several laws clearly indicate national significance
  - BSI indicates the desired resources are living species
  - Economic interest (resource use) is excluded
- Standard of value—ecosystem attribute sustainability
  - Species security and distinction terms indicate scarcity
  - Sustainability is captured in species population viability
- In advanced BSI form, viable populations are included

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Resource Significance Index:

RSI = *w*H + wC + wS + wP + wY + wG+ wU

- Resource significance criteria and full-value weights
  - H=Habitat scarcity (25)
  - C=Connectivity for native species (25)
  - S=Special status species (Only 1 needed)(10)
  - P=Plan recognition (10) National Significance
  - Y=Hydrologic (habitat) naturalness (20)
  - G=Geomorphologic (habitat) naturalness (20)
  - U=Sustainability (habitat) (O & M cost) (20)
- *w* is between 0 & 1, for low, medium or full value
- Calculation is additive—no variable is essential

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Resource Significance Index (RSI):

- National interest: Restoring native species?
  - No evidence of restoration interest in all species.
  - Not clear that economic interest is excluded
- Standard of value—native species sustainability?
  - The criteria have different "scarcity" measures
  - All native species included; many are sustainable
  - Sustainability is not in the national interest terms

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Case Study:

- Compared BSI and RSI for 24 projects
- About 25% of total
- Selected to be representative
  - Range of RSI scores
  - Size and Complexity
  - Habitat type
  - Location

Table 2. BSI & RSI Scores for 12 Corps Projects

Project/ Program	Habitat	BSI Score	RSI Score
Everglades	Large warm wetland & estuary	**44.52**	**120**
Ohio	Large warm-cool river & wetlands	**12.01**	**120**
Napa Salt Marsh	Large cool estuarine wetland	**11.45**	**100**
Arkansas River	Large warm river	**2.30**	**81**
Great Lakes (Chicago)	Large cool to cold lakes	**1.53**	**90**
Barataria	Medium warm estuary & wetland	**1.03**	**110**
Rio Grande	Medium warm river & wetlands	**0.65**	**86**
Columbia River	Large cool estuary & wetlands	**0.51**	**100**
Red Mill Pond	Small cool wetland	**0.32**	**70**
Snake River	Medium cold river	**0.25**	**66**
Fourche Bayou	Small warm wetland	**0.05**	**58**
Lake Chautauqua	Small to medium warm Lake	**0**	**25**

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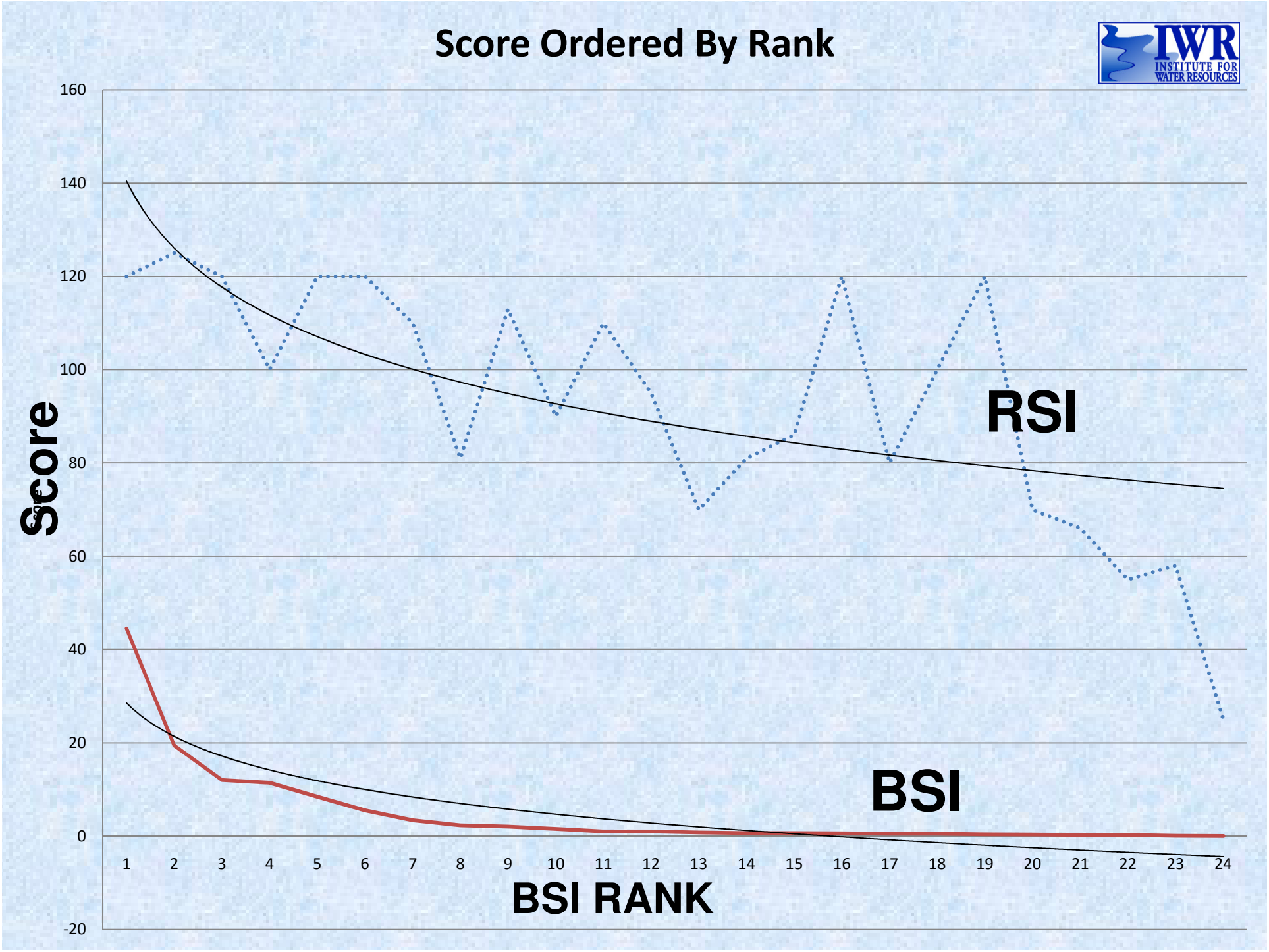
Score Ordered By Rank
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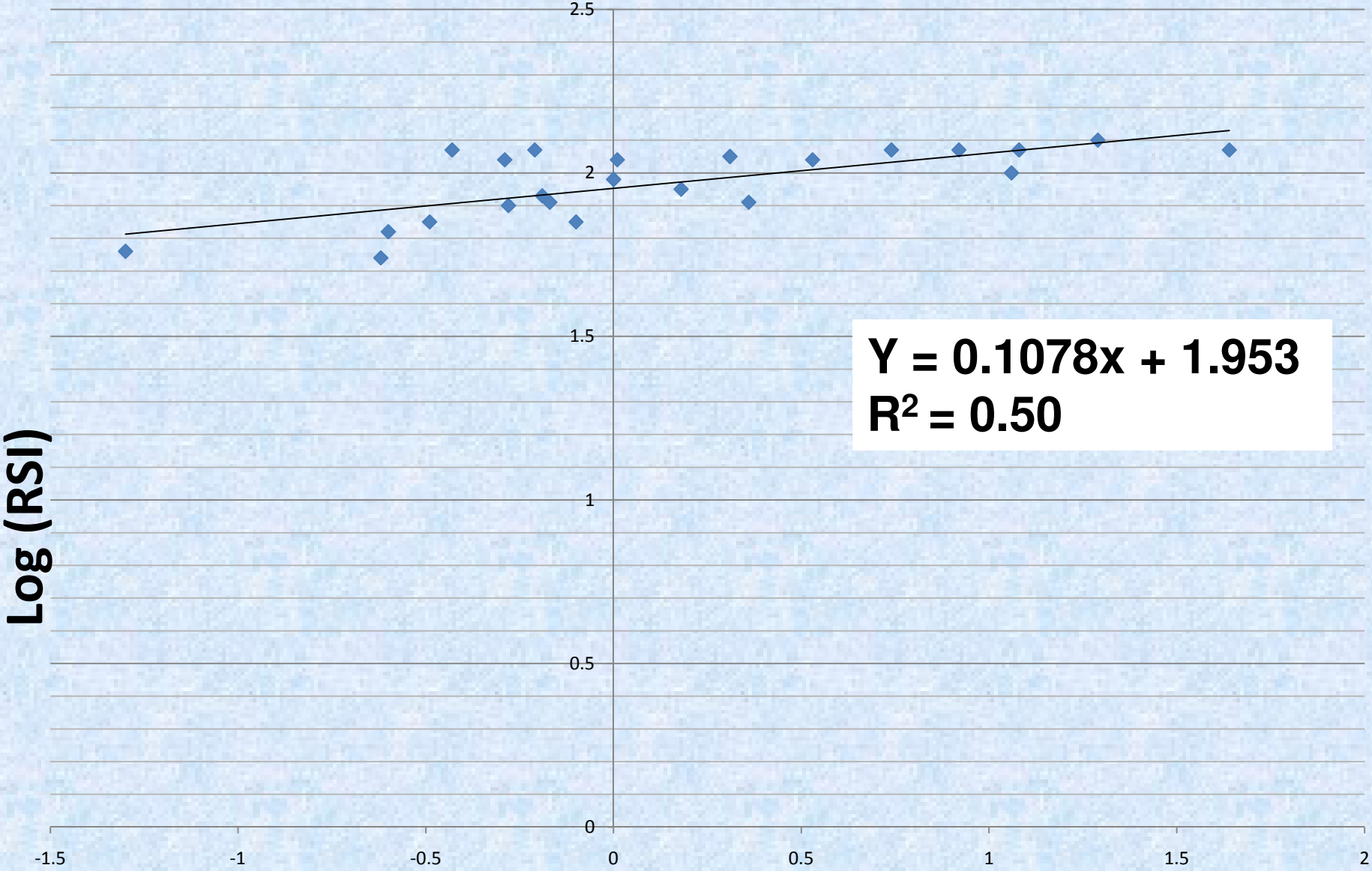
Score
160
140
120
100
80
60
40
20
0
-20
RSI
BSI
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
BSI RANK

Relationship Between BSI and RSI Scores



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Summary

- National interest
  - BSI based in restoring unsustainable species (ESA)
  - RSI based in restoring all native species. (Law?)
- Standard of value
  - BSI based in ecological attribute scarcity
  - RSI standard is not clear
- The 50 % difference in ranking is significant
- They differ most where few scarce species
- The BSI better distinguishes project rank
- Need for further improvements is implied

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